

COMPLIANCE For FCC PART 15 Subpart C

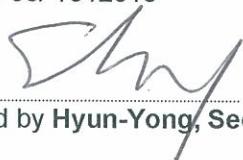
Applicant Name:	Date of Testing
DUALi INC.	May 26, 2015 to June 16, 2015
Address:	Test Site/Location
306, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, South Korea	#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea
	Test Report No.: BWS-15-RF-0006
	BWS FRN: 0009936881
FCC ID:	SWUITOUCHPOPV2

Model(s)	iTOUCH POP V2
EUT Type	SMART CARD READER
Operating Frequency	13.56 MHz
Modulation Type	ASK
FCC Classification	Operation within the band 13.110–14.010 MHz
FCC Rule Part(s)	FCC Part 15 Subpart C §15.225

The product was received on May 26, 2015 and testing was completed on June 16, 2015. We, BWS TECH Inc. would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of BWS TECH Inc. the test report shall not be reproduced except in full.

(Date) 06/ 16 /2015



Tested by Hyun-Yong, Seol

(Date) 06/ 16 /2015



Reviewed by Bang-Hyun, Nam

BWS TECH INC.

#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do
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TABLE OF CONTENTS

1. General Information.....	3
2. Description of Test Facility.....	4
3. Test Methodology.....	5
4. Summary of Test Results.....	6
5. Test Data.....	7
5.1 20 dB bandwidth.....	7
5.2 Field Strength in the 13.553–13.567 MHz band.....	9
5.3 Field Strength in the 13.410–13.553 MHz and 13.567–13.710 MHz bands..	12
5.4 Field Strength in the 13.110–13.410 MHz and 13.710–14.010 MHz bands..	13
5.5 Field Strength of any emissions appearing outside of the 13.110–14.010 MHz band.....	15
5.6 Frequency tolerance of the carrier signal.....	19
5.7 Conducted Emission.....	21

FCC TEST REPORT

Scope – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

1. General Information

1.1 Applicant

- **Company Name** : DUALi INC.
- **Company Address** : 306, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do South Korea
- **Phone/Fax** : Tel No. : +82-31-213-0078 Fax No. : +82-31-213-0074

1.2 Manufacturer

- **Company Name** : DUALi INC.
- **Company Address** : 306, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do South Korea
- **Phone/Fax** : Tel No. : +82-31-213-0078 Fax No. : +82-31-213-0074

1.3 EUT Description

- **EUT Type** : SMART CARD READER
- **Model Name** : iTOUCH POP V2
- **S/N** : None.
- **Operating Frequency** : 13.56 MHz
- **Number of Channels** : 1 Channel
- **Modulation Method** : ASK
- **Power source** : DC 12V
- **Battery** : N/A
- **Antenna Peak Gain** : 0 dBi

1.4 Other Information

- **FCC Rule Part(s)** : Part 15 Subpart C §15.225
- **Test Procedure** : ANSI C63.10-2013
- **FCC ID** : SWUITOUCHPOPV2
- **Date of Test** : May 26, 2015 to June 12, 2015
- **Place of Test** : BWS TECH Inc.(FCC Registration Number : 287786)
#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon,
Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea
TEL: +82 31 333 5997 FAX: +82 31 333 0017

2. Description of Test Facility

Site Description

Test Lab.	 Accredited by Industry Canada, February 27, 2012 The Certificate Registration Number is 4963A-2.
	 Accredited by FCC, September 03, 2013 The Certificate Registration Number is 287786.
	 Accredited by VCCI, July 10, 2012 The Certificate Registration Number is C-4326
	 Accredited by RRA(EMC,RF, SAR), November 27, 2014 The Certificate Registration Number is KR0017
	 Accredited by KOLAS(KS Q ISO/IEC 17025), October 7, 2014 The Certificate Registration Number is KT174
Name of Firm	: BWS TECH Inc.
Site Location	: #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea

3. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209, 15.215 and 15.225.

3.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and, operating in a manner that intends to maximize its emission characteristics in a continuous normal application

3.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.215 and 15.225 of the FCC Rules Part 15 Subpart C.

3.3 FCC Part 15.205 Restricted Bands Of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions.

The provisions in Section 15.35 apply to these measurements.

3.4 Description Of Test Modes

For intentional radiators, measurements of the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

4. Summary of Test Results

Operation within the band 13.110–14.010 MHz			
TEST Description	Standard Section	Requirements	Result
20 dB bandwidth	§ 15.215(c)	§ 15.215(c)	Pass
Field strength in the 13.553–13.567 MHz band	§ 15.225(a)	15,848 μ V/m(84 dB μ V/m) at 30 meters	Pass
Field strength in the 13.410–13.553 MHz and 13.567–13.710 MHz band	§ 15.225(b)	334 μ V/m (50.5 dB μ V/m) at 30 meters	Pass
Field strength in the 13.110–13.410 MHz and 13.710–14.010 MHz band	§ 15.225(c)	106 μ V/m (40.5 dB μ V/m) at 30 meters	Pass
Field strength of any emissions appearing outside of the 13.110–14.010MHz band	§ 15.225(d)	§15.209	Pass
Frequency tolerance of the carrier signal	§ 15.225(e)	within ± 0.01 %	Pass
Conducted Emission	§ 15.207(a)	§ 15.207(a)	Pass

5. Test Data

5.1 20 dB bandwidth

5.1.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

5.1.2 Test Limit

15.215(c), Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

5.1.3 Measurement Procedure

The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector. Record the 20 dB bandwidth of the carrier.

The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector. The vertical Scale is set to 10dB per division. The horizontal scale is set to 20 kHz per division. Read the down 20dB bandwidth of the carrier.

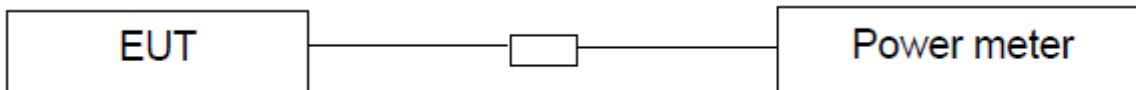
Set the spectrum analyzer: Span = 15 kHz

Set the spectrum analyzer: RBW = 510 Hz, VBW = 510 Hz

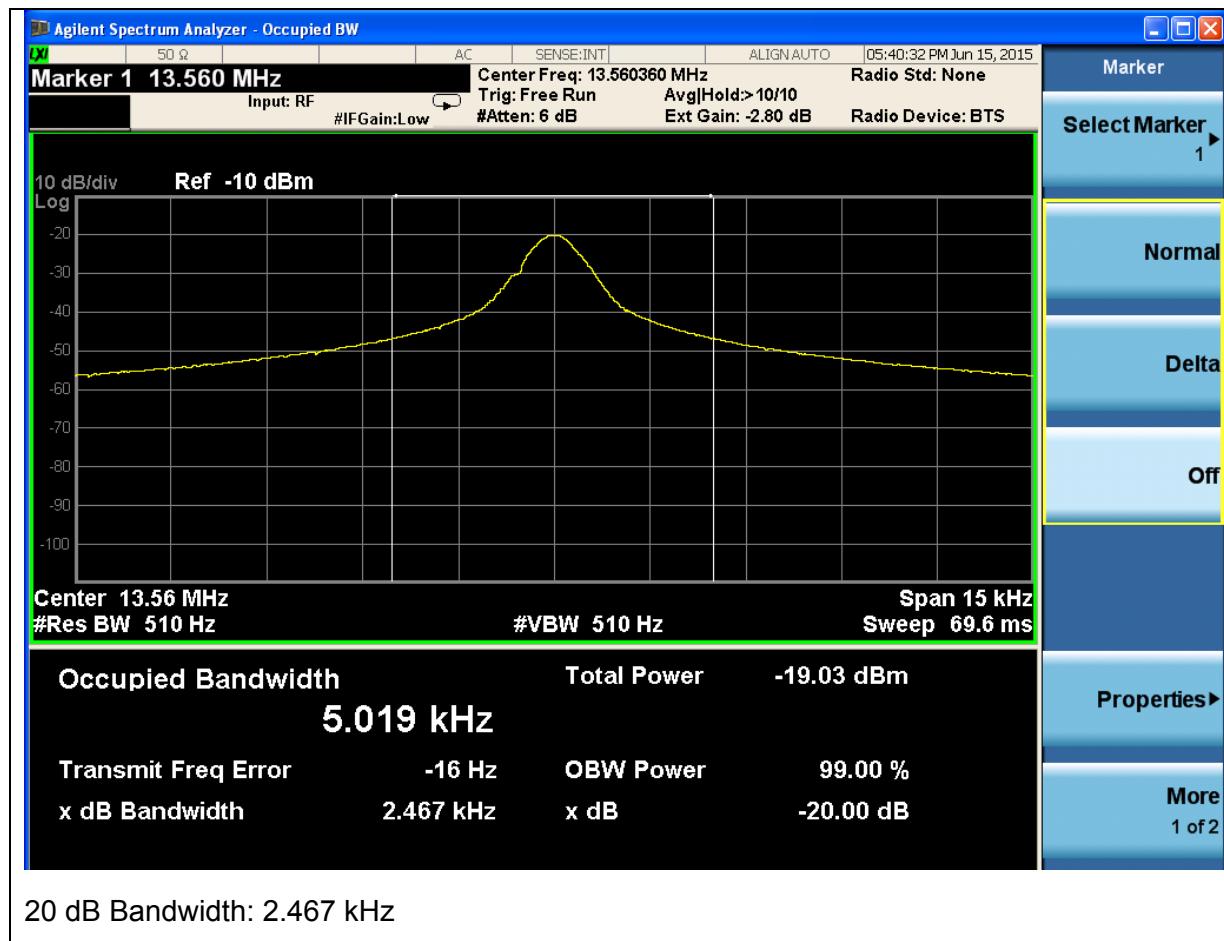
Sweep = auto; Detector Function = Peak. Trace = Max Hold.

Mark the peak frequency and -20dB points bandwidth.

5.1.4 Test SET-UP (Block Diagram of Configuration)



5.1.5 Test Result



5.2 Field Strength in the 13.553–13.567 MHz band

5.2.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	FSP13	Rohde & Schwarz	100760	2016/02/06
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3122	2016/04/02
Antenna Master	JAC-3	DAE IL EMC	N/A	N/A
Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
RF Cable_10m	Test No.2	Hubersunhner	N/A	2016/01/14
Loop Antenna	HFH2-Z2	Rohde & Schwarz	881056/6	2016/01/06
Horn Antenna	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D 234	2015/09/15
Horn Antenna	BBHA 9170	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170157	2015/11/14
RF Amplifier	PAM-118A	COM-POWER	551019	2015/07/21
Antenna Master	N/A	AUDIX	N/A	2015/09/17
Antenna Turntable Controller	ACT	AUDIX	N/A	2015/09/17
RE Below 1 GHz CHAMBER	N/A	SY Corp.	N/A	N/A
RE Above 1 GHz CHAMBER	N/A	SY Corp.	N/A	2015/09/17
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

5.2.2 Test Limit

Within the band 13.553–13.567MHz, the field strength of any emissions shall not exceed 15.848 μ V/m (84 dB μ V/m) at 30 meters.

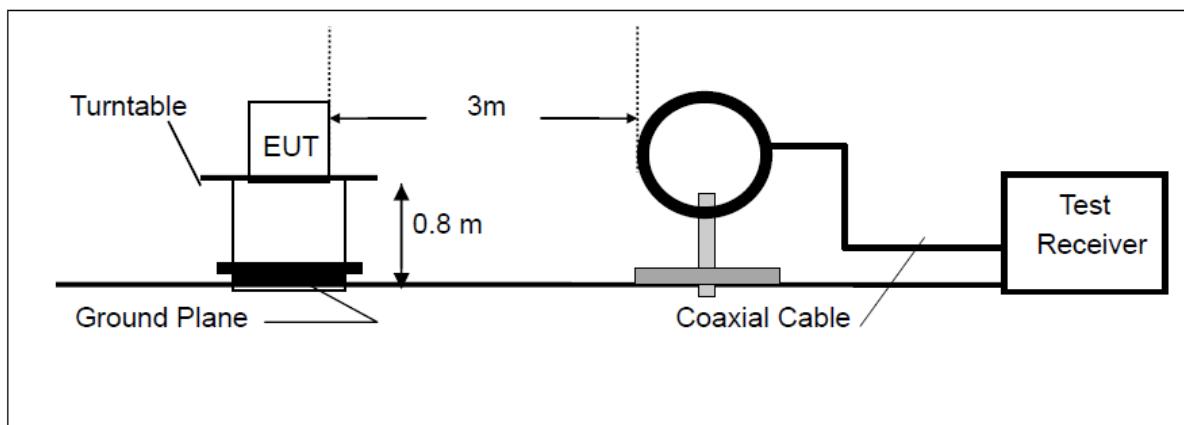
5.2.3 Measurement Procedure

The measurements were performed using quasi-peak detector with 9 kHz RBW at the distance of 3 m. Distance correction* was applied to the measurement result in order to comply with 30 m limits. The EUT was measured on three orthogonal axis and was rotated 360°

30 m to 3 m correction factor calculation (for 13.56 MHz band):

$$40 \times \log (30 \text{ m} / 3 \text{ m}) = 40 \text{ dB}$$

5.2.4 Test SET-UP (Block Diagram of Configuration)



5.2.5 Test Result

Frequency [MHz]	Reading [dB μ V]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μ V/m]	Emission Level [dB μ V/m]	Detector
13.56	21.69	H	19.83	0.43	124.00	41.95	QP
13.56	26.51	V	19.83	0.43	124.00	46.77	QP

5.3 Field Strength in the 13.410-13.553 MHz and 13.567-13.710 MHz bands

5.3.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	FSP13	Rohde & Schwarz	100760	2016/02/06
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3122	2016/04/02
Antenna Master	JAC-3	DAE IL EMC	N/A	N/A
Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
RF Cable_10m	Test No.2	Hubersunhner	N/A	2016/01/14
Loop Antenna	HFH2-Z2	Rohde & Schwarz	881056/6	2016/01/06
Horn Antenna	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D 234	2015/09/15
Horn Antenna	BBHA 9170	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170157	2015/11/14
RF Amplifier	PAM-118A	COM-POWER	551019	2015/07/21
Antenna Master	N/A	AUDIX	N/A	2015/09/17
Antenna Turntable Controller	ACT	AUDIX	N/A	2015/09/17
RE Below 1 GHz CHAMBER	N/A	SY Corp.	N/A	N/A
RE Above 1 GHz CHAMBER	N/A	SY Corp.	N/A	2015/09/17
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

5.3.2 Test Limit

Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 μ V/m (50.5 dB μ V/m) at 30 meters.

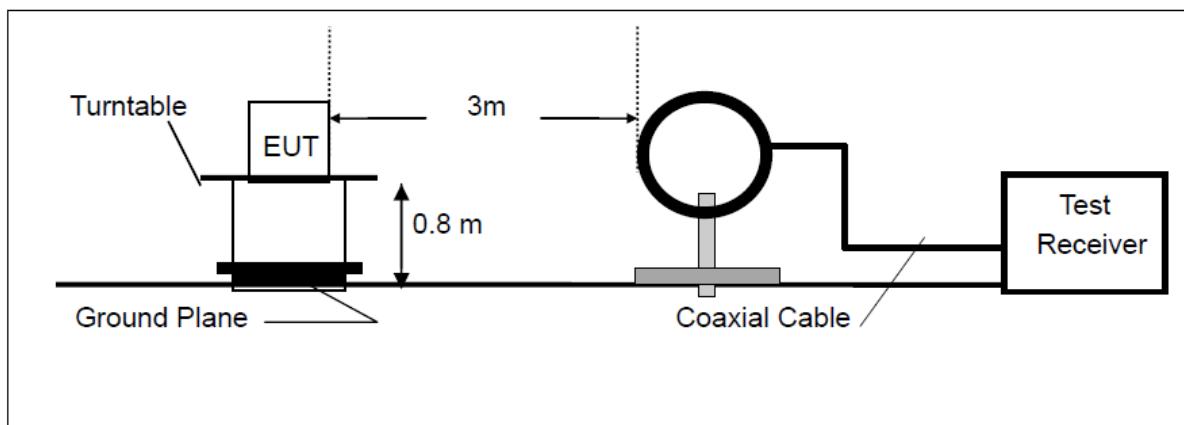
5.3.3 Measurement Procedure

The measurements were performed using quasi-peak detector with 9 kHz RBW at the distance of 3 m. Distance correction* was applied to the measurement result in order to comply with 30 m limits. The EUT was measured on three orthogonal axis and was rotated 360°

30 m to 3 m correction factor calculation (for 13.56 MHz band):

$$40 \times \log (30 \text{ m} / 3 \text{ m}) = 40 \text{ dB}$$

5.3.4 Test SET-UP (Block Diagram of Configuration)



5.3.5 Test Result

Frequency [MHz]	Reading [dB μ V]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μ V/m]	Emission Level [dB μ V/m]	Detector
13.45	14.95	H	19.83	0.42	90.50	35.20	QP
13.51	14.77	H	19.83	0.43	90.50	35.03	QP
13.54	15.35	H	19.83	0.43	90.50	35.61	QP
13.58	14.48	H	19.83	0.43	90.50	34.74	QP
13.62	14.49	H	19.83	0.43	90.50	34.75	QP
13.68	14.86	H	19.83	0.43	90.50	35.12	QP
13.45	14.79	V	19.83	0.42	90.50	35.04	QP
13.49	14.45	V	19.83	0.42	90.50	34.70	QP
13.55	15.56	V	19.83	0.43	90.50	35.82	QP
13.57	16.85	V	19.83	0.43	90.50	37.11	QP
13.61	14.37	V	19.83	0.43	90.50	34.63	QP
13.66	14.51	V	19.83	0.43	90.50	34.77	QP

5.4 Field Strength in the 13.110-13.410 MHz and 13.710-14.010 MHz bands

5.4.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	FSP13	Rohde & Schwarz	100760	2016/02/06
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3122	2016/04/02
Antenna Master	JAC-3	DAE IL EMC	N/A	N/A
Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
RF Cable_10m	Test No.2	Hubersunhner	N/A	2016/01/14
Loop Antenna	HFH2-Z2	Rohde & Schwarz	881056/6	2016/01/06
Horn Antenna	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D 234	2015/09/15
Horn Antenna	BBHA 9170	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170157	2015/11/14
RF Amplifier	PAM-118A	COM-POWER	551019	2015/07/21
Antenna Master	N/A	AUDIX	N/A	2015/09/17
Antenna Turntable Controller	ACT	AUDIX	N/A	2015/09/17
RE Below 1 GHz CHAMBER	N/A	SY Corp.	N/A	N/A
RE Above 1 GHz CHAMBER	N/A	SY Corp.	N/A	2015/09/17
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

5.4.2 Test Limit

Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 μ V/m (40.5 dB μ V/m) at 30 meters.

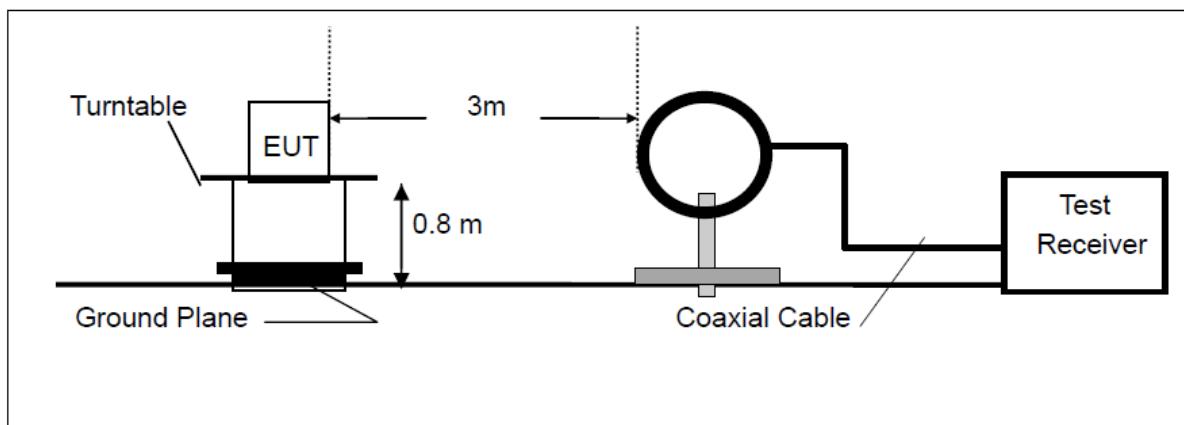
5.4.3 Measurement Procedure

The measurements were performed using quasi-peak detector with 9 kHz RBW at the distance of 3 m. Distance correction* was applied to the measurement result in order to comply with 30 m limits. The EUT was measured on three orthogonal axis and was rotated 360°

30 m to 3 m correction factor calculation (for 13.56 MHz band):

$$40 \times \log (30 \text{ m} / 3 \text{ m}) = 40 \text{ dB}$$

5.4.4 Test SET-UP (Block Diagram of Configuration)



5.4.5 Test Result

Frequency [MHz]	Reading [dB μ V]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μ V/m]	Emission Level [dB μ V/m]	Detector
13.23	14.59	H	19.84	0.42	80.50	34.85	QP
13.27	14.65	H	19.83	0.42	80.50	34.90	QP
13.38	14.68	H	19.83	0.42	80.50	34.93	QP
13.72	14.20	H	19.83	0.43	80.50	34.46	QP
13.74	14.97	H	19.83	0.43	80.50	35.23	QP
13.88	15.76	H	19.82	0.43	80.50	36.01	QP
13.16	15.11	V	19.84	0.42	80.50	35.37	QP
13.25	14.83	V	19.84	0.42	80.50	35.09	QP
13.32	15.18	V	19.83	0.42	80.50	35.43	QP
13.71	15.70	V	19.83	0.43	80.50	35.96	QP
13.83	15.47	V	19.82	0.43	80.50	35.72	QP
13.91	15.26	V	19.82	0.43	80.50	35.51	QP

5.5 Field Strength of any emissions appearing outside of the 13.110–14.010 MHz band

5.5.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	FSP13	Rohde & Schwarz	100760	2016/02/06
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3122	2016/04/02
Antenna Master	JAC-3	DAE IL EMC	N/A	N/A
Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
RF Cable_10m	Test No.2	Hubersunhner	N/A	2016/01/14
Loop Antenna	HFH2-Z2	Rohde & Schwarz	881056/6	2016/01/06
Horn Antenna	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D 234	2015/09/15
Horn Antenna	BBHA 9170	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170157	2015/11/14
RF Amplifier	PAM-118A	COM-POWER	551019	2015/07/21
Antenna Master	N/A	AUDIX	N/A	2015/09/17
Antenna Turntable Controller	ACT	AUDIX	N/A	2015/09/17
RE Below 1 GHz CHAMBER	N/A	SY Corp.	N/A	N/A
RE Above 1 GHz CHAMBER	N/A	SY Corp.	N/A	2015/09/17
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

5.5.2 Test Limit

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

5.5.3 Measurement Procedure

1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna. The center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

2) 30 MHz to 1 GHz emissions:

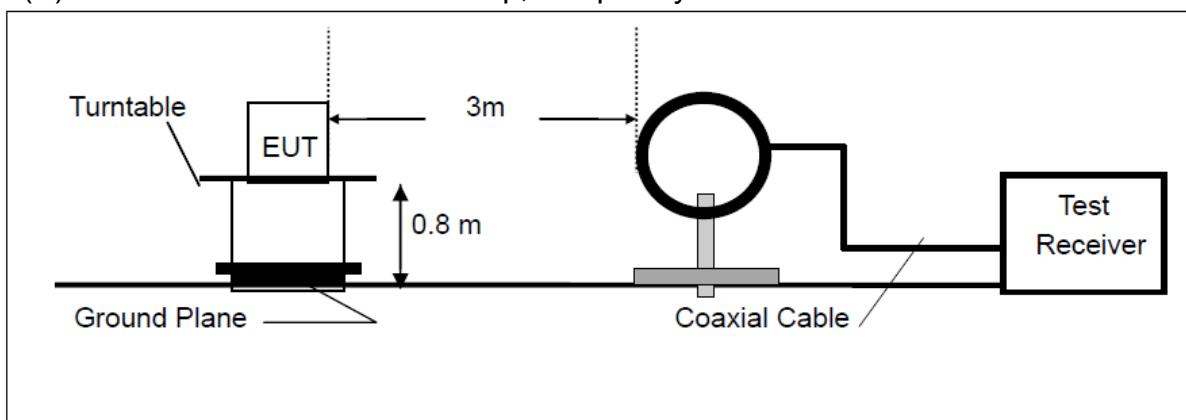
For testing performed with the bi-log type antenna. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

Detector Peak for pre-scan

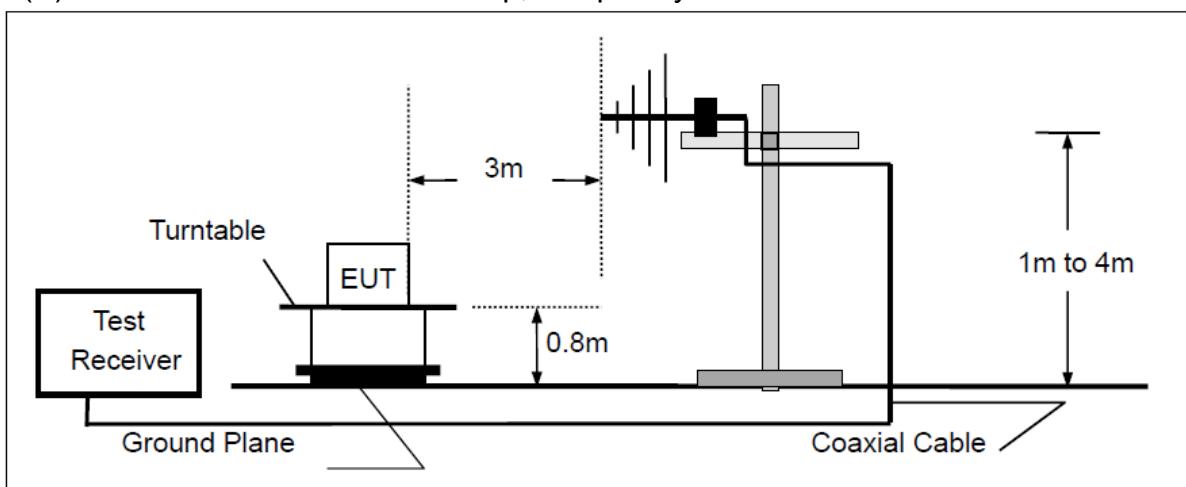
Test Receiver test setup	Detector		
	9 kHz-150 kHz	150 kHz-30 MHz	30 MHz-1000 MHz
RBW	200 Hz	9 kHz	120 kHz
VBW	\geq RBW	\geq RBW	\geq RBW
Sweep	auto	auto	auto
Detector function	QP	QP	AV
Trace	max hold	max hold	max hold

5.5.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



5.5.4 Test Result

Frequency [MHz]	Reading [dB μ V]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μ V/m]	Emission Level [dB μ V/m]
33.09	10.82	H	15.00	0.62	40.00	26.44
103.08	11.87	H	12.23	1.04	43.50	25.14
197.20	17.04	H	12.55	1.44	43.50	31.03
369.40	18.32	H	16.29	1.97	46.00	36.58
477.17	15.48	H	18.45	2.24	46.00	36.17
968.93	12.11	H	24.98	3.26	54.00	40.35
47.49	11.86	V	12.41	0.71	40.00	24.98
136.46	11.47	V	14.33	1.20	43.50	27.00
184.49	12.81	V	13.86	1.39	43.50	28.06
470.52	13.50	V	18.32	2.23	46.00	34.05
863.06	13.19	V	23.94	3.05	46.00	40.18

5.6 Frequency tolerance of the carrier signal

5.6.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Spectrum analyzer	N9020A	Agilent	US46220101	2015/09/11
RF Cable_2m	Test No.1	Hubersunhner	N/A	2016/01/14
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	2016/01/13

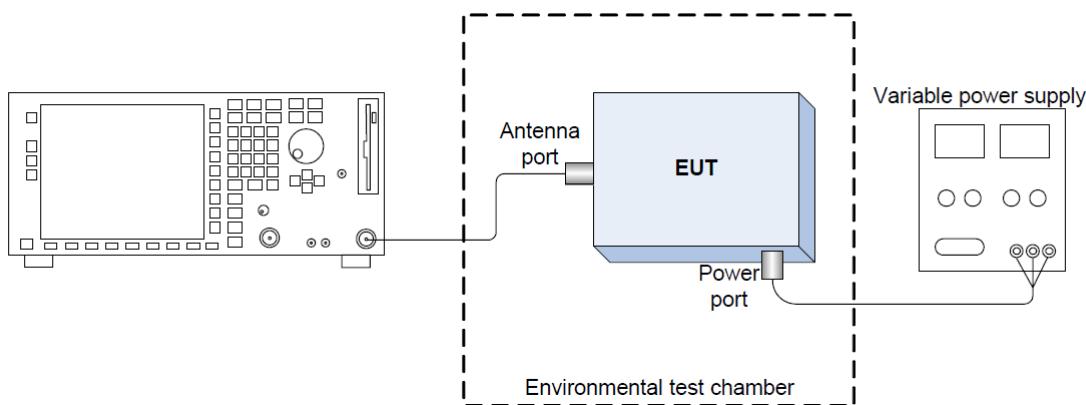
5.6.2 Test Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20°C . For battery operated equipment, the equipment tests shall be performed using a new battery.

5.6.3 Measurement Procedure

1. The EUT was turn-up.
2. With all power removed, the temperature was decreased to -20°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
3. The temperature tests were performed for the worst case.
4. Variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C . The maximum frequency change was recorded.

5.6.4 Test SET-UP (Block Diagram of Configuration)



5.6.5 Test Result

Operating Frequency: 13.56 MHz

Conditions	Measured frequency (MHz)	Within $\pm 0.01\%$ operating frequency (MHz)
+50 °C, Nominal voltage	13.5603	13.5586-13.5614
+40 °C, Nominal voltage	13.5603	
+30 °C, Nominal voltage	13.5603	
+20 °C, 85 % Normal voltage	13.5603	
+20 °C, Nominal voltage	13.5603	
+20 °C, 115 % Normal voltage	13.5603	
+10 °C, Nominal voltage	13.5602	
0 °C, Nominal voltage	13.5604	
-10 °C, Nominal voltage	13.5604	
-20 °C, Nominal voltage	13.5604	

5.7 Conducted Emission

5.7.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
LISN	ENV216	ROHDE & SCHWARZ	100324	16/01/12
LISN	FCC-LISN-50-50-2-02	FCC	03074	16/01/12
#2 Conducted Cable_2.7m	N/A	N/A	N/A	16/01/14
Test Receiver	ESPI	ROHDE & SCHWARZ	100063	16/01/12
CE CHAMBER	N/A	SY Corp.	N/A	15/09/17
AC Power Source	15001ix-CTS	California Instruments	56255/56256/56257	16/01/13

5.7.2 Test Limit

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

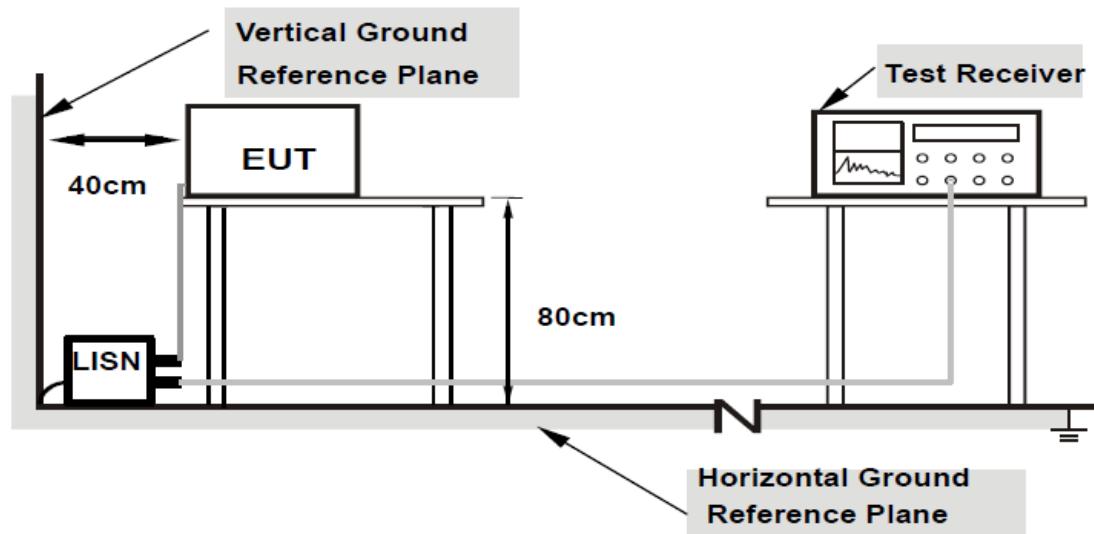
Frequency of emission(MHz)	Conducted limit(dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

5.7.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network(LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

5.7.4 Block Diagram of Test Setup



5.7.5 Test Result

RFID - H

Conducted Test Report

BWS TECH EMC Team

BWS TECH INC.
EMI Measurement Test Report
Device Under Test DUALI
Operating Conditions H
Operator Name
Test Specification
Comment RFID(13.56) MODE

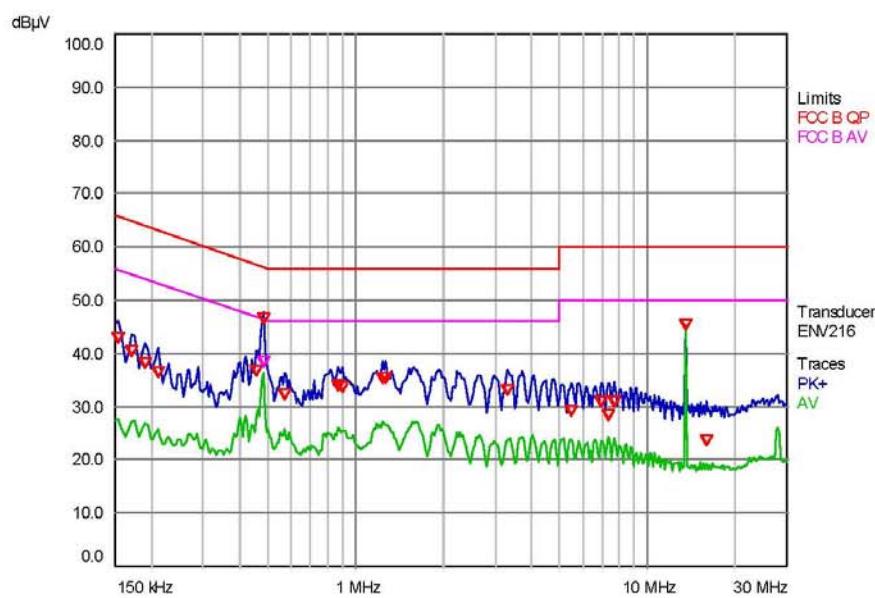
Scan Settings (3 Ranges)

Frequencies			Receiver Settings			
Start	Stop	Step	Res BW	M-Time	Atten	Preamp
150 kHz	500 kHz	4 kHz	9 kHz (6dB)	50 ms	20 dB	On
500 kHz	5 MHz	4 kHz	9 kHz (6dB)	20 ms	20 dB	On
5 MHz	30 MHz	4 kHz	9 kHz (6dB)	10 ms	20 dB	On

Final Measurement

Detectors: QP, AV
Peaks: 1 Meas Time: 1 s
Acc. Margin: 6 dB

Pre-measurement Graph



Conducted Test Report

BWS TECH EMC Team

Final Measurement Results

Trace	Frequency (MHz)	Level (dB μ V)	Limit (dB μ V)	Delta Limit (dB)	Delta Ref (dB)	Comment
1 QP	0.154	41.97	65.78	-23.81		
1 QP	0.17	39.31	64.96	-25.65		
1 QP	0.19	37.26	64.04	-26.78		
1 QP	0.21	35.34	63.21	-27.87		
1 QP	0.458	35.88	56.73	-20.85		
1 QP	0.482	45.60	56.30	-10.70		
2 AV	0.482	37.43	46.30	-8.87		
1 QP	0.568	31.31	56.00	-24.69		
1 QP	0.872	32.83	56.00	-23.17		
1 QP	0.904	32.54	56.00	-23.46		
1 QP	1.232	34.26	56.00	-21.74		
1 QP	1.272	34.45	56.00	-21.55		
1 QP	3.328	32.09	56.00	-23.91		
1 QP	5.48	28.14	60.00	-31.86		
1 QP	6.956	29.83	60.00	-30.17		
1 QP	7.344	27.24	60.00	-32.76		
1 QP	7.68	29.78	60.00	-30.22		
1 QP	13.56	44.44	60.00	-15.56		
1 QP	15.932	22.58	60.00	-37.42		

* = limit exceeded

RFID - N

Conducted Test Report

BWS TECH EMC Team

BWS TECH INC.

EMI Measurement Test Report

Device Under Test: DUALI
 Operating Conditions: N
 Operator Name:
 Test Specification:
 Comment: RFID(13.56) MODE

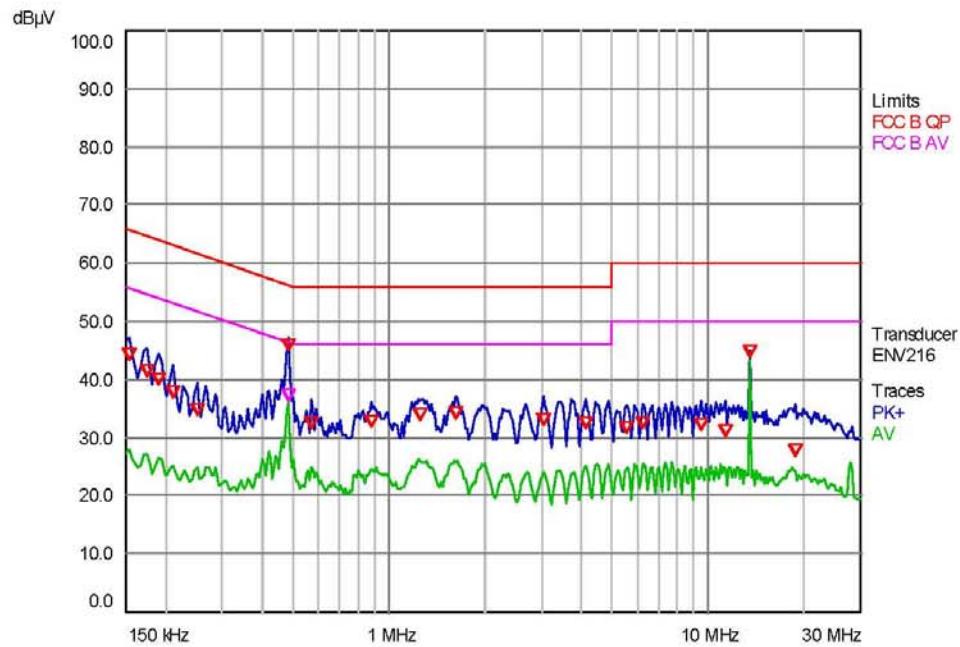
Scan Settings (3 Ranges)

Frequencies			Receiver Settings			
Start	Stop	Step	Res BW	M-Time	Atten	Preamp
150 kHz	500 kHz	4 kHz	9 kHz (6dB)	50 ms	20 dB	On
500 kHz	5 MHz	4 kHz	9 kHz (6dB)	20 ms	20 dB	On
5 MHz	30 MHz	4 kHz	9 kHz (6dB)	10 ms	20 dB	On

Final Measurement

Detectors: QP, AV
 Peaks: 1
 Meas Time: 1 s
 Acc. Margin: 6 dB

Pre-measurement Graph



Conducted Test Report

BWS TECH EMC Team

Final Measurement Results

Trace	Frequency (MHz)	Level (dB μ V)	Limit (dB μ V)	Delta Limit (dB)	Delta Ref (dB)	Comment
1 QP	0.154	43.33	65.78	-22.45		
1 QP	0.174	40.63	64.77	-24.14		
1 QP	0.19	39.19	64.04	-24.85		
1 QP	0.21	36.95	63.21	-26.26		
1 QP	0.25	33.76	61.76	-28.00		
1 QP	0.482	45.04	56.30	-11.26		
2 AV	0.482	36.42	46.30	-9.88		
1 QP	0.572	31.56	56.00	-24.44		
1 QP	0.88	31.80	56.00	-24.20		
1 QP	1.252	32.85	56.00	-23.15		
1 QP	1.616	33.11	56.00	-22.89		
1 QP	3.04	32.09	56.00	-23.91		
1 QP	4.156	31.65	56.00	-24.35		
1 QP	5.528	30.66	60.00	-29.34		
1 QP	6.272	31.62	60.00	-28.38		
1 QP	9.54	31.31	60.00	-28.69		
1 QP	11.304	30.09	60.00	-29.91		
1 QP	13.56	43.83	60.00	-16.17		
1 QP	18.756	26.72	60.00	-33.28		

* = limit exceeded